National Institute of Environmental Health Sciences

Highly localized sensitivity to climate forcing drives endemic cholera in a megacity

Author(s): Reiner RC Jr, King AA, Emch M, Yunus M, Faruque AS, Pascual M
Year: 2012
Journal: Proceedings of The National Academy of Sciences of The United States of America. 109 (6): 2033-2036

Abstract:

The population dynamics of endemic cholera in urban environments--in particular interannual variation in the size and distribution of seasonal outbreaks--remain poorly understood and highly unpredictable. In part, this situation is due to the considerable demographic, socioeconomic, and environmental heterogeneity of large and growing urban centers. Despite this heterogeneity, the influence of climate variability on the population dynamics of infectious diseases is considered a large-scale, regional, phenomenon, and as such has been previously addressed for cholera only with temporal models that do not incorporate spatial structure. Here we show that a probabilistic spatial model can explain cholera dynamics in the megacity of Dhaka, Bangladesh, and afford a basis for cholera forecasts at lead times of 11 mo. Critically, we find that the action of climate variability (El Nino southern oscillation and flooding) is quite localized: There is a climate-sensitive urban core that acts to propagate risk to the rest of the city. The modeling framework presented here should be applicable to cholera in other cities, as well as to other infectious diseases in urban settings and other biological systems with spatiotemporal interactions.

Source: http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3277579

Resource Description

Early Warning System:

resource focus on systems used to warn populations of high temperatures, extreme weather, or other elements of climate change to prevent harm to health

A focus of content

Exposure :

weather or climate related pathway by which climate change affects health

El Nino Southern Oscillation, Extreme Weather Event

Extreme Weather Event: Flooding

Geographic Feature:

resource focuses on specific type of geography

Urban

Geographic Location: ☑

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: Other Asian Country

Other Asian Country: Dhaka, Bangladesh

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Infectious Disease

Infectious Disease: Foodborne/Waterborne Disease

Foodborne/Waterborne Disease: Cholera

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Outcome Change Prediction

Population of Concern: A focus of content

Resource Type: ☑

format or standard characteristic of resource

Research Article

Timescale: ☑

time period studied

Medium-Term (10-50 years)